1035-220 Unexpected High Incidence of Serious Pacemaker Problems Detected by Pre-and Postoperative Interrogations: A Two-Year Experience

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Background: ACC Guidelines for perioperative care of the pacemaker (PM) patient suggest both pre- and post-operative interrogations. No systematic evaluation of this practice has been performed.
Methods: With IRB approval, records from Jan, 2000 through Dec, 2001 were reviewed. We evaluated compliance with nationally published follow-up guidelines at a patient's first visit to the Pre-Anesthesia Clinic. If a PM was checked postoperatively, we also recorded the incidence and type(s) of problems.
Results: We found 172 PM patients (224 visits) for 149 surgical- and 75 non-surgical procedures.
Compliance with follow-up guidelines was poor (see Table). Intervention was required in 15.7% (27 / 172) of the 1st-visit patients. Problems included:
- battery depletion (9);
- inadequate pacing energy (10 [6 ventricular, 4 atrial]);
- improper sensing (4 [1 ventricular, 3 atrial]);
- other (9); and
- multiple problems (5).

In the 52 subsequent visits, one patient needed a PM replacement.
Postoperative checks revealed 1 device reset and 6 pacing threshold increases (5 ventricular, 1 atrial) in 149 surgical cases.
Conclusion: Many of our patients had not undergone a timely or satisfactory evaluation of their PM prior to their preanesthetic visit, and 15.7% required intervention prior to their elective procedure. We also found a 4.7% incidence of postoperative PM problems. These findings: 1) suggest that many PM patients could be at risk for perioperative problems; and 2) support ACC guidelines for perioperative PM care.

Compliance with Nationally Published Guidelines for Pacemaker Follow-up Care

Follow-up Guideline	Applied to	Number of Patients Evaluated	Telephone Check Recommendations (number of patients, % of total)			Comprehensive In-Office Evaluation Recommendations (number of patients, % of total)		
			Compliant	Noncompliant	No Data	Compliant	Noncompliant	No Data
North American Society of Pacing and Electrophysiology (NASPE)	All Patients	172	104 (60.5%)	66 (38.4%)	2 (1.2%)	111 (64.5%)	56 (32.6%)	5 (2.9%)
NASPE	Any patient with an older device at "Intensified Follow-up Interval"	44	12 (27.3%)	32 (72.7%)	0	21 (47.7%)	20 (45.5%)	3 (6.8%)
Medicare	Any patient over 65 years of age	143	72 (50.3%)	69 (48.3%)	2 (1.4%)	76 (53.1%)	62 (43.4%)	5 (3.5%)

1035-221 Percutaneous Pacemaker Lead Extraction in the Presence of Intracardiac Mass: Transesophageal Echocardiographic Findings and Clinical Outcomes

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Background: The clinical safety of percutaneous lead extraction (PLE) with a vegetation or intracardiac mass ≥1 cm in diameter has not been established.
Methods: The records of 108 consecutive patients considered high risk for PLE secondary to prolonged implant duration and comorbidity were reviewed. All patients underwent transesophageal echocardiography (TEE)-guided extraction.
Results: Intracardiac masses were found by TEE in 18 cases. The indication for lead extraction was bacteremia in 9, pocket infection without bacteremia in 7, and lead malfunction in 2 cases. In one patient, TEE detected a 2.8 cm mass attached to the right atrial aspect of the lead in the presence of a patent foramen ovale (PFO) with a significant right-to-left shunt; PLE was aborted and the patient underwent surgical removal. The mass sizes in the seventeen patients who underwent PLE were <1 cm in 2 patients, ≥1 cm but <2 cm in 5 patients, and ≥2 cm in 6 patients (mass size data unavailable in 4 cases). In all but three cases, the mass was attached to the right atrial side of the lead. In 12 cases, the mass was not visualized after lead extraction, suggesting pulmonary embolization, but no patient developed acute hemodynamic compromise. Only one patient developed clinically apparent pulmonary embolism post-operatively, which was confirmed by spiral computed tomography. The patient was managed medically and discharged home in stable condition. A second patient required a thoracotomy because severe fibrotic adhesions precluded successful PLE.
Conclusions: 1) Seventeen percent of this patient population, which included non-bacteremic patients, had TEE-detectable masses attached or proximate to the leads. 2) PLE was performed safely in 17 patients with lead-associated masses, 11 of which were ≥1cm in size, and only one patient developed limited clinical sequelae secondary to pulmonary embolization. 3) TEE can identify cases where surgical explantation is preferable, such as a mass in the presence of a PFO with a significant right-to-left shunt.

1035-222 Local Velocity Estimation Analysis During Bipolar Single Site and Linear Triple Site Rapid Pacing in Canine Models: Implications for Antitachycardia Pacing

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In anisotropic tissue, nonuniform conduction may cause block or delay, providing a substrate for the onset and maintenance of reentrant atrial arrhythmias. We tested the hypothesis that bipolar, linear, triple site pacing on the right atrium will generate more uniform wave front propagation than bipolar, single site pacing, thereby, reducing or eliminating conduction block or delay. **Methods -** 6 pericarditis dogs and 2 normal dogs were studied. Three plunge wire electrode pairs were placed 5-7mm apart in a perpendicular and a parallel configuration at the superior aspect of the crista terminalis. The center pair, which remained in the same position for both linear configurations, was used for single site pacing. Using these three electrode configurations, pacing was performed at 200 and 300ms cycle lengths (CLs) for 6 sec. During pacing, 404 unipolar atrial electrograms were recorded simultaneously from electrode arrays placed epicardially on both atria. Local conduction velocity vectors were computed for every site using an automated algorithm and plotted in a velocity vector field in a space domain for one beat during each episode. A histogram of absolute velocity vector angles from the x-axis was plotted to assess uniformity of wave front propagation. **Results -** Triple site pacing showed: (1) a distribution of velocity vectors with more uniform magnitude and direction compared to single site pacing; (2) a predominant absolute velocity vector angle, in contrast to single site pacing which showed a scattered angle distribution; (3) the overall mean epicardial speed of both triple site pacing configurations was faster than single site pacing for each pacing CL in each dog. The local velocity vector field plot, the absolute velocity vector angle histogram, and the overall mean epicardial speed demonstrated that triple site pacing created more uniform linear propagation compared to single site pacing. **Conclusions –** Both perpendicular and parallel linear triple site pacing created more uniform propagation compared to single site pacing with less or no conduction block or delay. These findings may help develop more effective and safer pacing techniques for termination and prevention of atrial arrhythmias.

1035-223 Magnetic Resonance Imaging of the Brain Can Be Safely Performed in Patients With Pacemakers

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Background: The safety of magnetic resonance imaging in patients with pacemakers is not known. We reviewed the outcomes of a clinical protocol allowing PM patients to undergo MRI.
Methods: Sixty brain MRI scans were performed on 46 patients using a novel protocol. Dual chamber PM was present in 32 patients and single chamber PM in 14 patients. Prior to the scan, lead configuration was programmed to bipolar. Asynchronous mode was programmed for PM-dependent patients. Monitoring during MRI included observation and pulse oximetry. Pacemaker interrogation was performed immediately before, immediately after, and 3 months after MRI. All studies were performed in the head coil of a Siemens 1.5T MRI whole body scanner. Conventional spin echo and echo-planar imaging (EPI) acquisitions were performed with parameters that held the whole body specific absorption rate (SAR) constant between 1-2Watts/kg.
Results: Mean atrial capture thresholds before, immediately after and 3 months after MRI scanning were 1.11V, 1.13V and 1.10V (p = NS), respectively. Mean ventricular capture thresholds were 1.20V, 1.21V and 1.33V (p = NS), respectively. Mean atrial sensing thresholds were 2.39mV, 2.17mV and 2.16mV (p = NS), respectively. Mean ventricular sensing thresholds were 8.47mV, 8.93mV and 9.79mV (p = NS), respectively. Mean atrial impedances were 593Ω, 609Ω and 556Ω (p = NS), respectively. Mean ventricular impedances were 661Ω, 678Ω and 657Ω (p = NS), respectively. No changes were observed in programming. No patient experienced any arrhythmia or symptoms.
Conclusion: Patients with pacemakers can safely undergo brain MRI imaging using this systematic and specific approach. No deleterious effects on PM or lead function were observed.

1035-224 Do Onset Mechanisms of Paroxysmal Atrial Fibrillation Influence the Arrhythmia Episode Duration in Patients With Dual Chamber Pacing? Relevance for Preventive Pacing Algorithms

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Background: Pacing algorithms to prevent paroxysmal atrial fibrillation (PAF) are mainly based on the suppression of premature atrial contractions (PAC's). However, according to studies based on the analysis of 24-hour Holter recordings more than half of all PAF episodes may be initiated by a solitary PAC ("sudden onset"). The objective of this study was to evaluate the incidence of sudden PAF onsets in a population of patients with dual chamber pacing and to relate the pre-onset PAC activity to the PAF episode duration.
Methods: A total of 264 PAF episodes in 45 pacemaker patients (Selection series, Vitatron Medical BV, Dieren, NL, all PAF preventive algorithms programmed off) with a history of PAF were included. The correct detection of PAF by the pacemaker diagnostic features was manually verified by analysis of the detailed onset reports of each PAF episode, including marker electrocardiograms. According to the PAC activity before PAF onset all